Fabrication of completely free-standing pyrolytic carbon string resonator

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Fabrication of completely free-standing pyrolytic carbon string resonator

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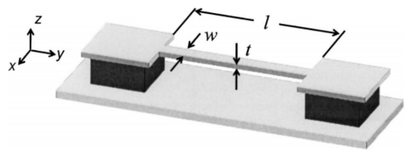
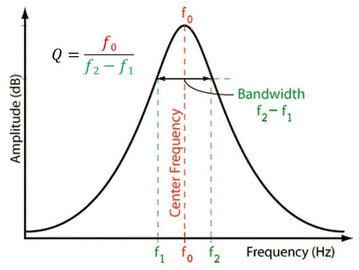
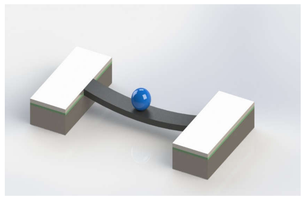
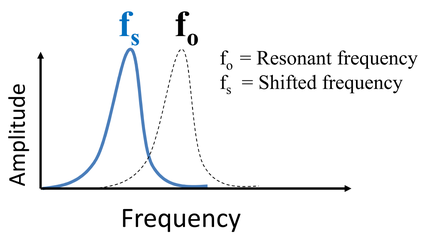
MEMS String Resonator





MEMS String resonator as mass sensor





Features [1]:

- Fast response
- High sensitivity
- Low power consumption
- Small size

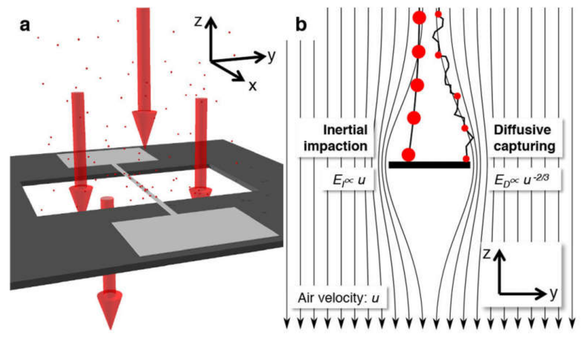
Objective

Fabricate the pyrolytic carbon string resonators with opening from the backside which give:

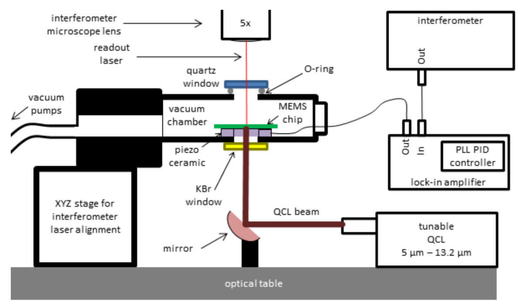
- Convenient for measurement with laser from the backside
- Easy sample deposition
- High resonance frequency and quality factor

Method

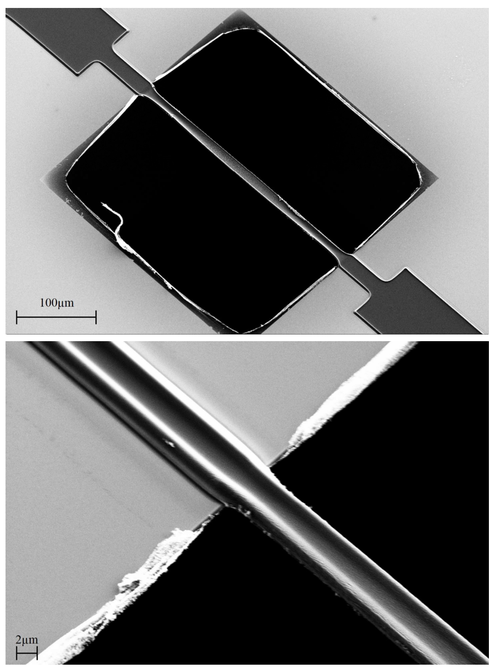
(a) Nanoparticle sampling, (b) Collection mechanisms [2]



Characterization Setup

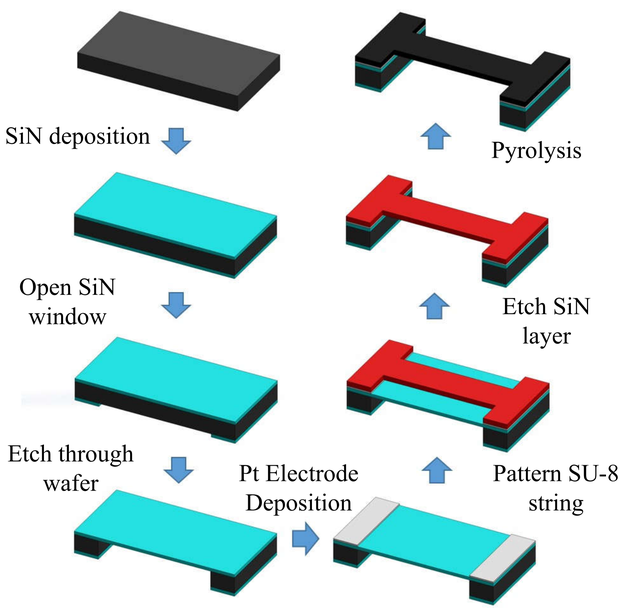


Fully free-standing pyrolytic carbon string resonator

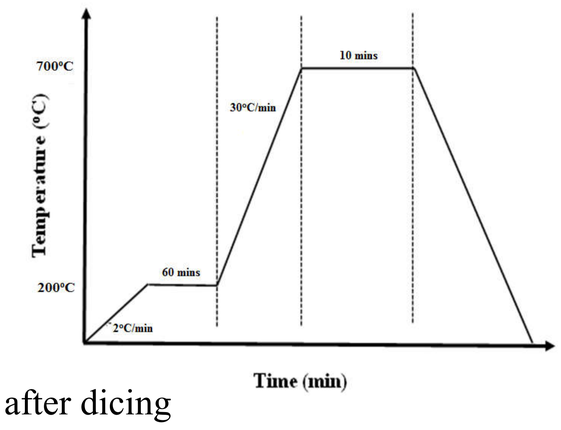


Fabrication

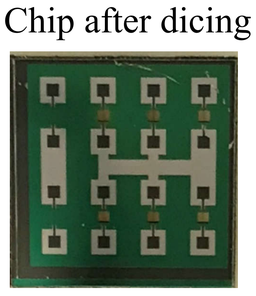
Fabrication process



Pyrolysis process



Chip after dicing



Each chip have 6 carbon string resonators with opening backside and 2 unreleased strings for integrated readout measurement.

Pyrolytic Carbon (PC)

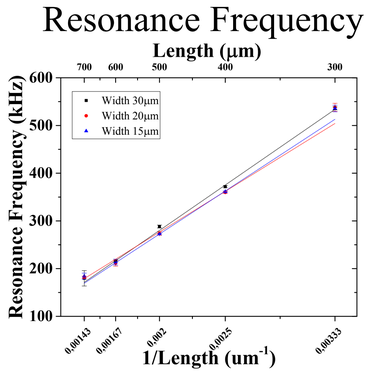
A type of turbostratic carbons, have similar structure to graphite. In PC the layers are disordered resulting in wrinkles or distortion within the layers.

Features:

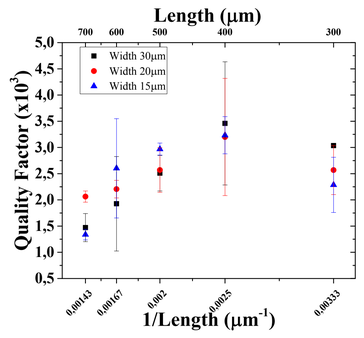
- Good wear resistance
- Controlable
- Biocompatible
- Conductive
- Good durability

Characterization

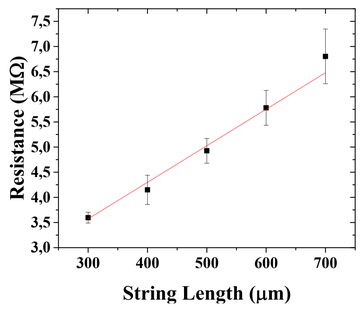
Resonance Frequency



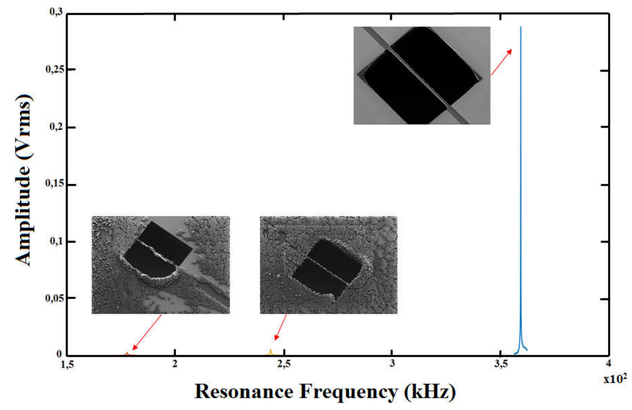
Quality Factor



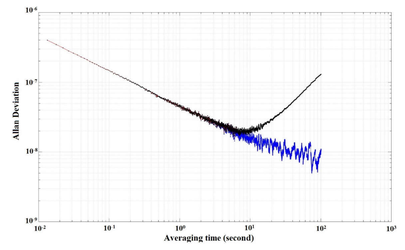
Conductivity of carbon string



Frequency Shift by adding Polystyrene micro beads



Allan Deviation of 300x30 µm carbon string



CONCLUSION

In this work, we present the fabrication of fully free-standing pyrolytic carbon string resonators which both are suitable for sample deposition and convenient for measurement from the backside laser. The results indicate that the fully free-standing pyrolytic carbon string resonators have a good resonant behavior and it can be used as mass sensor.

REFERENCES

[1] A. Boisen, S. Dohn, S. S. Keller, S. Schmid and M. Tenje, Rep. Prog. Phys, Vol. 74, 2011.

[2] Schmid, S, Kurek, M, Adolphsen, J & Boisen, A 2013, *SPIE Newsroom*.

ACKNOWLEDGEMENT

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